

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Continuation Application of:)
Shinji TAKEDA et al.) **Atty. Docket: TM&K0007**
Serial No. _____ (based on U. S.)
Patent Application Serial No. 08/981,702,)
filed March 31, 1998))
Filed: Herewith)
For: SEMICONDUCTOR DEVICE AND)
PROCESS FOR FABRICATION) Date: February 20, 2001
THEREOF)

PRELIMINARY AMENDMENT (A)

BOX: PATENT APPLICATION

Assistant Commissioner of Patents
Washington, D. C. 20231

Sir:

Prior to calculating the filing fee, please amend the above-captioned application as follows:

IN THE SPECIFICATION:

On page 1, immediately below the title, please insert the following paragraph:

-- This application is a continuation of U. S. Patent Application Serial No. 08/981,702, filed March 31, 1998, which in turn corresponds to International Application No. PCT/JP96/01886, filed July 8, 1996, which in turn is related to and claims the early filing date of Japanese Patent Application No. 7-171154, filed July 6, 1995. The entire disclosures of the above applications are hereby incorporated by reference. --

IN THE CLAIMS:

Please cancel all of the claims, i.e., claims 1-24, without prejudice and substitute therefore the following new claims 25-47:

-- 25. A semiconductor device comprising a support member, a semiconductor chip, and an attaching member for attaching the semiconductor chip to the support member, wherein:

said attaching member is a cured product of a die-bonding material;

said die-bonding material is a film comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said film having a modulus of elasticity of 10 MPa or less at a temperature of 250°C.

26. A semiconductor device comprising a support member, a semiconductor chip, and an attaching member for attaching the semiconductor chip to the support member, wherein:

said attaching member is a cured product of a die-bonding material;

said die-bonding material is a film comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said film having a water absorption of 1.5% by volume or less.

27. A semiconductor device comprising a support member, a semiconductor chip, and an attaching member for attaching the semiconductor chip to the support member, wherein:

said attaching member is a cured product of a die-bonding material;

said die-bonding material is a film comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said film having a residual volatile component in an amount not more than a 3.0% by weight.

28. A semiconductor device comprising a support member, a semiconductor chip, and an attaching member for attaching the semiconductor chip to the support member, wherein:

said attaching member is a cured product of a die-bonding material;

said die-bonding material is a film comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said film having a saturation moisture absorption of 1.0% by volume or less.

29. A semiconductor device comprising a support member, a semiconductor chip, and an attaching member for attaching the semiconductor chip to the support member, wherein:

said attaching member is a cured product of a die-bonding material;

said die-bonding material is a film comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said film having a peel strength of 0.5 Kgf/5 x 5 mm chip or above at a stage where the semiconductor chip has been bonded to the support member.

30. A semiconductor device comprising a support member, a semiconductor chip, and an attaching member for attaching the semiconductor chip to the support member, wherein:

said attaching member is a cured product of a die-bonding material;

said die-bonding material is a film comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said film having, at a stage where the semiconductor chip has been bonded to the support member, a void volume of 10% or less in terms of voids present in the die-bonding material and at an interface between the die-bonding material and the support member.

31. A semiconductor device comprising a support member, a semiconductor chip, and an attaching member for attaching the semiconductor chip to the support member, wherein:

said attaching member is a cured product of a die-bonding material;

said die-bonding material is a film comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said film i) having a planar dimension not larger than a planar dimension of the semiconductor chip, and ii) not protruding outward from a region of the semiconductor chip at a stage where the semiconductor chip has been bonded to the support member.

32. A process for fabricating a semiconductor device, comprising the steps of attaching a semiconductor chip to a support member, with a die-bonding material, and encapsulating the semiconductor chip with a resin;

said die-bonding material comprising a filmy die-bonding material comprising polyimide and epoxy resin comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said filmy die-bonding material having a water absorption of 1.5% by volume or less.

33. A process for fabricating a semiconductor device, comprising the steps of attaching a semiconductor chip to a support member with a die-bonding material, and encapsulating the semiconductor chip with a resin;

said die-bonding material comprising a filmy die-bonding material comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said filmy die-bonding material having a residual volatile component in an amount not more than 3.0% by weight.

34. A process for fabricating a semiconductor device, comprising the steps of attaching a semiconductor chip to a support member with a die-bonding material, and encapsulating the semiconductor chip with a resin;

said die-bonding material comprising a filmy die-bonding material comprising polyimide and epoxy resin comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said filmy die-bonding material having a modulus of elasticity of 10 Mpa or less at a temperature of 250°C.

35. A process for fabricating a semiconductor device, comprising the steps of attaching a semiconductor chip to a support member with a die-bonding material, and encapsulating the semiconductor chip with a resin;

said die-bonding material comprising a filmy die-bonding material comprising polyimide and epoxy resin comprising one or more resins selected from the group consisting of silicone resin, acrylic resin and polyimide resin; resin, polyimide resin and epoxy resin; and

said filmy die-bonding material having, at a stage where the semiconductor chip has been bonded to the support member, a void volume of 10% or less in terms of voids present in the die-bonding material and at an interface between the die-bonding material and the support member.

36. A process for fabricating a semiconductor device, comprising the steps of attaching a semiconductor chip to a support member with a die-bonding material, and encapsulating the semiconductor chip with a resin;

said die-bonding material comprising a die-bonding material comprising filmy die-bonding material comprising polyimide and epoxy resin comprising one or more resins

selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said filmy die-bonding material having a peel strength of 0.5 kgf/5 x 5 mm chip or above at a stage where the semiconductor chip has been bonded to the support member.

37. A process for fabricating a semiconductor device, comprising the steps of attaching a semiconductor chip to a support member with a die-bonding material, and encapsulating the semiconductor chip with a resin;

said die-bonding material comprising a filmy die-bonding material comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said filmy die-bonding material i) having a planar dimension not larger than a planar dimension of the semiconductor chip, and ii) not protruding outward from a region of the semiconductor chip at a stage where the semiconductor chip has been bonded to the support member.

38. A process for fabricating a semiconductor device, comprising the steps of attaching a semiconductor chip to a support member with a die-bonding material, and encapsulating the semiconductor chip with a resin;

said die-bonding material comprising a filmy die-bonding material comprising one or more resins selected from the group consisting of silicone resin, acrylic resin and polyimide resin; resin, polyimide resin and epoxy resin;

the process further comprising the steps of:

mounting said semiconductor chip on said filmy die-bonding material; and
attaching said semiconductor chip to said filmy die-bonding material under
conditions of a temperature of 150°C to 250°C, bonding time of 0.1 (inclusive) second to 2
seconds, and a pressure of 0.1 to 4 gf/mm².

39. A process for fabricating a semiconductor device, according to any one of
claims 32 to 37, further comprising the steps of

mounting said semiconductor chip on said filmy die-bonding material; and
attaching said semiconductor chip to said filmy die-bonding material under
conditions of a temperature of 150°C to 250°C, bonding time of 0.1 (inclusive) second to 2
seconds, and a pressure of 0.1 to 4 gf/mm².

40. A die-bonding material for use in a process for fabricating a semiconductor
device, comprising the step of attaching a semiconductor chip to a support member with
said die-bonding material;

said die-bonding material being a film comprising one or more resins selected from
the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and
said film having a water absorption of 1.5% by volume or less.

41. A die-bonding material for use in a process for fabricating a semiconductor
device, comprising the step of attaching a semiconductor chip to a support member with
said die-bonding material;

said die-bonding material being a film comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said film having a residual volatile component in an amount not more than 3.0% by weight.

42. The die-bonding material as described in claim 41, wherein said film has a saturation moisture absorption of 1.0% by volume or less.

43. A die-bonding material for use in a process for fabricating a semiconductor device, comprising the step of attaching a semiconductor chip to a support member with said die-bonding material;

said die-bonding material being a film comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin; and

said film having a modulus of elasticity of 10 Mpa or less at a temperature of 250°C.

44. The semiconductor device according to claim 25, 26, 27, 28, 29, 30 or 31, wherein the polyimide is a thermoplastic.

45. The semiconductor device according to claim 44, wherein the polyimide is a polyimide synthesized from a combination which is selected from the group consisting of a combination of 1,2-(ethylene)bis(trimellitate anhydride) and bis(4-amino-3,5-dimethylphenyl)methane; a combination of 1,2-(ethylene)bis(trimellitate anhydride) and

4,4'-diaminodiphenylether; a combination of 1,2-(ethylene)bis(trimellitate anhydride) and bis(4-amino-3,5-diisopropylphenyl)methane; a combination of 1,2-(ethylene)bis(trimellitate anhydride) and 2,2-bis[4-(4-aminophenoxy)phenyl] propane; a combination of a mixture of 1,2-(ethylene)bis(trimellitate anhydride) and 1,10-(decamethylene)bis(trimellitate anhydride) being the same mol as the mixture and 2,2-bis[4-(4-aminophenoxy)phenyl] propane; and a combination of 1,10-(decamethylene)bis(trimellitate anhydride) and 2,2-bis[4-(4-aminophenoxy)phenyl] propane.

46. The semiconductor device according to claim 25, 26, 27, 28, 29, 30 or 31, wherein the die-bonding material contains a metal filler.

47. A semiconductor device according to claim 25, 26, 27, 28, 29, 30 or 31, wherein said die-bonding material is a film comprising polyimide resin and epoxy resin. --

REMARKS

With the above amendments, the specification has been amended to identify and incorporate by reference the parent application, i.e., Serial No. 08/981,702, as well as the international application and Japanese application upon which the present application claims priority.

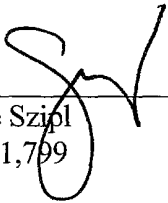
Additionally, all of the claims originally filed with the parent application, i.e., claims 1-24, have been cancelled and new claims 25-47 have been inserted for prosecution in this continuation application.

Accordingly, it is believed that this application is in good condition for examination, and the Examiner's early and favorable action is respectfully solicited.

Questions are welcomed by the below-signed attorney for applicants.

Respectfully submitted,

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